Math 0350 Practice Test **Unit One**
Chapters 4 and 8 **Martin-Gay 4th edition**

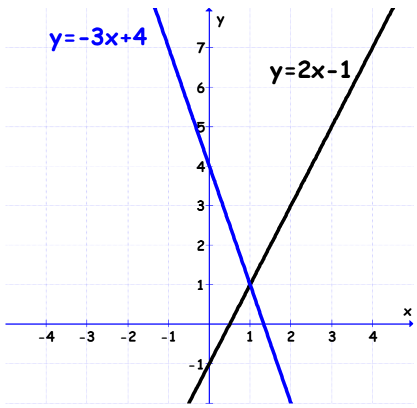
1. Solve by graphing: $\begin{cases} y = 2x - 1 \\ y = -3x + 4 \end{cases}$

Solution:

To solve by graphing we need to graph both lines and look for the point of intersection they have:

x	$y = 2x - 1$
-1	$2(-1) - 1 = -3$
0	$2(0) - 1 = -1$
1	$2(1) - 1 = 1$

x	$y = -3x + 4$
0	$-3(0) + 4 = 4$
1	$-3(1) + 4 = 1$
2	$-3(2) + 4 = -2$



The point of intersection is (1, 1), so is the solution.

(1, 1)

2. Solve by substitution: $\begin{cases} 2x + y = 4 \\ 3x - 2y = 6 \end{cases}$

Solution: We will express one of the variables through the other. The easiest to express is the "y" variable from the first equation because the coefficient of y is 1:

$y = 4 - 2x$

Substitute in the other equation:

$3x - 2y = 6$
$3x - 2(4 - 2x) = 6$
$3x - 8 + 4x = 6$
$7x - 8 = 6$
$7x = 14$
$x = 2$

To find y value substitute back again:

$y = 4 - 2x$
$y = 4 - 2(2)$
$y = 0$

The solution is the point (2, 0)

3. Solve by addition: $\begin{cases} 4x-5y=-7 \\ 6x+3y=21 \end{cases}$

Solution: To solve by addition we need to make the coefficient of x or y opposite numbers. If we decide to eliminate x we can multiply the first equation with 3 and the second equation with -2. Don't forget to multiply all the terms from each equation:

$$\begin{cases} 4x-5y=-7 & |\times 3 \\ 6x+3y=21 & |\times -2 \end{cases}$$

$$+\begin{cases} 12x-15y=-21 \\ -12x-6y=-42 \end{cases}$$

$$-21y=-63$$

$$y=3$$

To find x value substitute in one of the equations:

$$4x-5y=-7$$
$$4x-5(3)=-7$$
$$4x-15=-7$$
$$4x=8$$
$$x=2$$

The solution is the point (2, 3)

4. Solve using any method: $\begin{cases} x-3y=6 \\ 2x-6y=12 \end{cases}$

Solution: We can see that the second equation is divisible by 2:

$$\begin{cases} x-3y=6 \\ 2x-6y=12 & |\div 2 \end{cases}$$

$$\begin{cases} x-3y=6 \\ x-3y=6 \end{cases}$$

Both equations are the same:

There are infinitely many points that satisfy the system.

5. Solve using any method: $\begin{cases} y=5x-1 \\ 5x-y=3 \end{cases}$

Solution: The first equation is already solved for "y", so it easy to solve the system with substitution:

Substitute in the other equation:

$$5x-(5x-1)=3$$
$$5x-5x+1=3$$
$$1=3$$

This equation is never true:

No solution

6. Tickets for a show cost \$2.00 for adults and \$1.50 for children. How many adult and how many children's tickets were sold if a total of 127 tickets were sold for \$214?

Solution:

	How many tickets were solved:	Unit price	Price per group
Adults	x	\$2.00	2x
Children	y	\$1.50	1.5y
Total	127		214

$$\begin{cases} x+y=127 \\ 2x+1.5y=214 \end{cases}$$

With substitution:

$$x=127-y$$
$$2(127-y)+1.5y=214$$
$$254-2y+1.5y=214$$
$$-0.5y=214-254$$
$$-0.5y=-40$$
$$y=80$$

To find x:

$$x=127-y$$
$$x=127-80$$
$$x=47$$

There were 47 adults and 80 children

7. Recall that two angles are complementary if their sum is 90°. Find the measures of two complementary angles if one is 36 degrees less than the other.

Solution:

First angle: x

Second angle: y

$$\begin{cases} x+y=90 \\ x=y-36 \end{cases}$$

To find the angles by substitution:

$$y-36+y=90$$
$$2y=90+36$$
$$2y=126$$
$$y=63$$
$$x=90-63=27$$

The angles are 27° and 63°

8. Using function notation, write the equation of a line containing the point $(-1,2)$ with slope of 3.

Solution: Using the point-slope formula: $y-y_1=m(x-x_1)$

$$y-2=3(x-(-1))$$
$$y-2=3x+3$$
$$y=3x+5$$
$$\boxed{f(x)=3x+5}$$

9. Using function notation, write the equation of a line containing the points $(4,-1)$ and $(-2,5)$.

Solution: The slope is:

$$m=\frac{y_2-y_1}{x_2-x_1}=\frac{5-(-1)}{-2-4}=\frac{5+1}{-2-4}=\frac{6}{-6}=-1$$

Using the point-slope formula: $y-y_1=m(x-x_1)$

$$y-(-1)=-1(x-4)$$
$$y+1=-x+4$$
$$y=-x+3$$
$$\boxed{f(x)=-x+3}$$

10. Using function notation, write the equation of a line containing the points $(1,-1)$ and perpendicular to $6y+2x=2$.

Solution: The slope of the perpendicular line is reciprocal and opposite of the slope of the line $6y+2x=2$. Solve for y this equation to find the slope:

$$6y=-2x+2$$
$$y=\frac{-2}{6}x+\frac{2}{6}$$
$$y=\frac{-1}{3}x+\frac{1}{3}$$

The slope of the perpendicular line is $m=-\frac{1}{3}$. The slope of the line that is required in this problem is $m=3$.

Using the point-slope formula: $y-y_1=m(x-x_1)$

$$y-(-1)=3(x-1)$$
$$y+1=3x-3$$
$$y=3x-4$$
$$\boxed{f(x)=3x-4}$$

11. Using function notation, write the equation of a line containing the points $(-2,4)$ and parallel to $4y-2x=9$.

Solution: The parallel lines have the same slope. Solve for y the equation $4y-2x=9$ to find the slope:

$$\begin{aligned}
&4y-2x=9\\
&4y=2x+9\\
&y=\frac{2}{4}x+\frac{9}{4}\\
&y=\frac{1}{2}x+\frac{9}{4}
\end{aligned}$$

The slope of the parallel line is $m=\frac{1}{2}$, so is the slope of the line that is required in this problem.

Using the point-slope formula: $y-y_1=m(x-x_1)$

$$\begin{aligned}
&y-4=\frac{1}{2}(x-(-2))\\
&y-4=\frac{1}{2}x+1\\
&y=\frac{1}{2}x+5\\
&\boxed{f(x)=\frac{1}{2}x+5}
\end{aligned}$$

12. Write the equation of the horizontal line containing the point $(5,3)$. Use function notation.

Solution: The horizontal line has an equation y = b. In this case $\boxed{y = 3.}$

13. If y varies directly as x, find the constant of variation and the direct variation equation for this situation: $y=4$ when $x=12$.

Solution: Direct variation looks like y = kx. To find k = ? we substitute the given information:

$$\begin{aligned}
&y=kx\\
&4=12k\\
&\frac{4}{12}=\frac{12k}{12}\\
&\boxed{k=\frac{1}{3} \qquad \Rightarrow \quad y=\frac{1}{3}x}
\end{aligned}$$

14. If y varies inversely as x, find the constant of variation and the direct variation equation for this situation: $y = 3$ when $x = 5$.

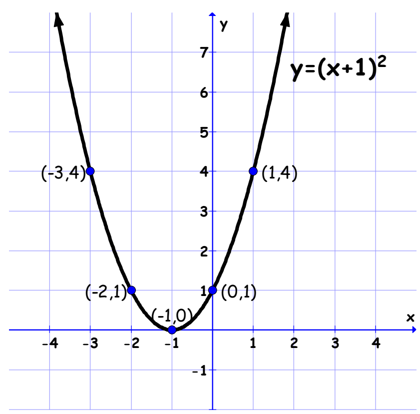
Solution: Direct variation looks like $y = \frac{k}{x}$. To find k = ? we substitute the given information:

$$y = \frac{k}{x}$$
$$3 = 5k$$
$$\frac{3}{5} = \frac{5k}{5}$$
$$\boxed{k = \frac{3}{5} \qquad \Rightarrow \quad y = \frac{3}{5x}}$$

15. Graph the function $g(x) = (x+1)^2$. Label 3 exact points. List the domain and range.

Solution: We always pick the first point to be the vertex of the parabola (this is the x-value that makes the expression under the square = 0. In this case this is x+1 = 0, or x = -1. Then we pick two points from each side of the vertex value and calculate the y values at them. If we work correctly the y values are going to be the same for each pair of x or the points are going to be symmetrical in respect of the axis of symmetry, which is the vertical line through the vertex:

x	$g(x) = (x+1)^2$
1	$(1+1)^2 = 4$
0	$(0+1)^2 = 1$
-1	$(-1+1)^2 = 0$
-2	$(-2+1)^2 = 1$
-3	$(-3+1)^2 = 4$



The vertex is at (0, 1);.

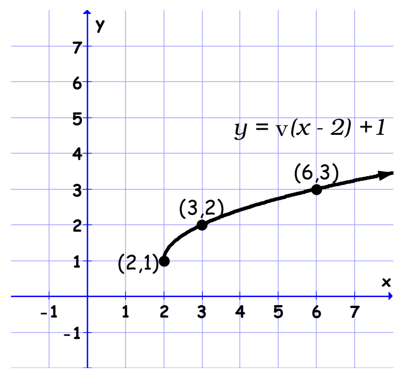
Domain: $(-\infty, \infty)$ (because we can plug any value for x, and we see from the graph that the graph continues unlimitedly to both sides.)

Range: $[0, \infty)$ (because there is no y-value lower than 0 on the graph; it is a closed interval, because there is a point that contains y=0.)

16. Graph the function $f(x)=\sqrt{x-2}+1$. Label 3 exact points. List the domain and range.

Solution: We always pick the first point to be at the corner of the graph (this is the x-value that makes the expression under the square root = 0. In this case this is x-2 = 0, or x = 2. Then we pick two points from each side of the corner point and calculate the y values at them. Notice that the square root graph goes one way only so we will only receive y-values to one of the sides of this function. I picked x = 6, because it is easy to take root of 4. If I pick x = 4, or 5, then I'll have to take a root of 2 or 3, which are not exact numbers:

x	$f(x)=\sqrt{x-2}+1$
0	$\sqrt{0-2}+1=\sqrt{-2}+1$
1	$\sqrt{1-2}+1=\sqrt{-1}+1$
2	$\sqrt{2-2}+1=\sqrt{0}+1=1$
3	$\sqrt{3-2}+1=\sqrt{1}+1=2$
6	$\sqrt{6-2}+1=\sqrt{4}+1=3$



The corner point is at (2, 1).

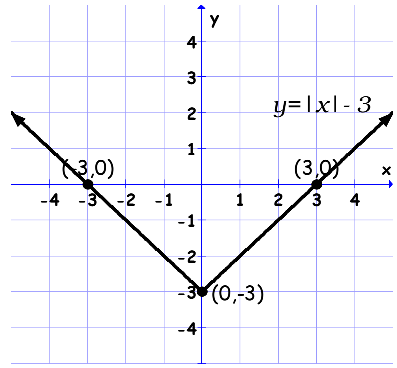
Domain: $[2,\infty)$ (because we cannot plug values for x less than 2; if we do we get negative numbers under the root)

Range: $[1,\infty)$ (because there is no y-value lower than 1 on the graph; it is a closed interval, because there is a point that contains y=1.)

17. Graph the function $f(x)=|x|-3$. Label 3 exact points. List the domain and range.

Solution: We always pick the first point to be the corner point of the graph (this is the x-value that makes the expression under the absolute value = 0. In this case this is x = 0. Then we pick two points from each side of the corner point and calculate the y values at them. If we work correctly the y values are going to be the same for each pair of x or the points are going to be symmetrical in respect of the the vertical line through the corner point:

x	$f(x)=\|x\|-3.$
2	$\|2\|-3=2-3=-1$
1	$\|1\|-3=1-3=-2$
0	$\|0\|-3=0-3=-3$
-1	$\|-1\|-3=1-3=-2$
-2	$\|-2\|-3=2-3=-1$

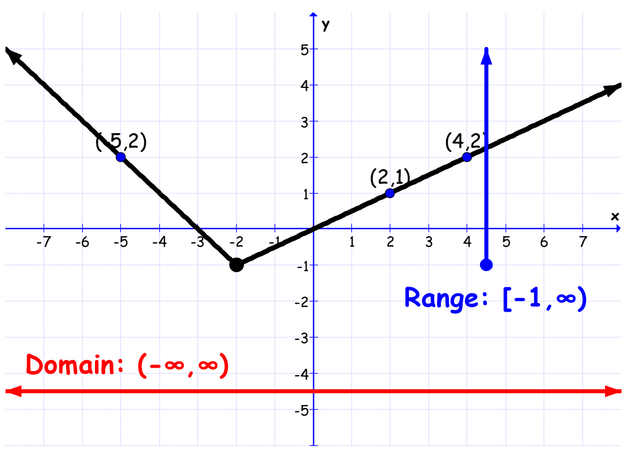


The corner is at (0, -3).

Domain: $(-\infty,\infty)$ (because we can plug any value for x, and we see from the graph that the graph continues unlimitedly to both sides.)

Range: $[-3,\infty)$ (because there is no y-value lower than -3 on the graph; it is a closed interval, because there is a point that contains y=-3.)

Use the graph of f (x) below to answer 18-21.



18. $f(2)=?$

Solution: The answer is the y-value of the point with x value: x = 2. $\boxed{f(2)=1}$

19. Find all values of x for which $f(x)=2$

Solution: The answer is the x-value of the point with y value: y = 2. $\boxed{x=-5;\quad x=4}$

20. The domain of $f(x)$ is? **Solution:** Domain: $\boxed{(-\infty,\infty)}$

21. The range of $f(x)$ is? **Solution:** Range: $\boxed{[-1,\infty)}$